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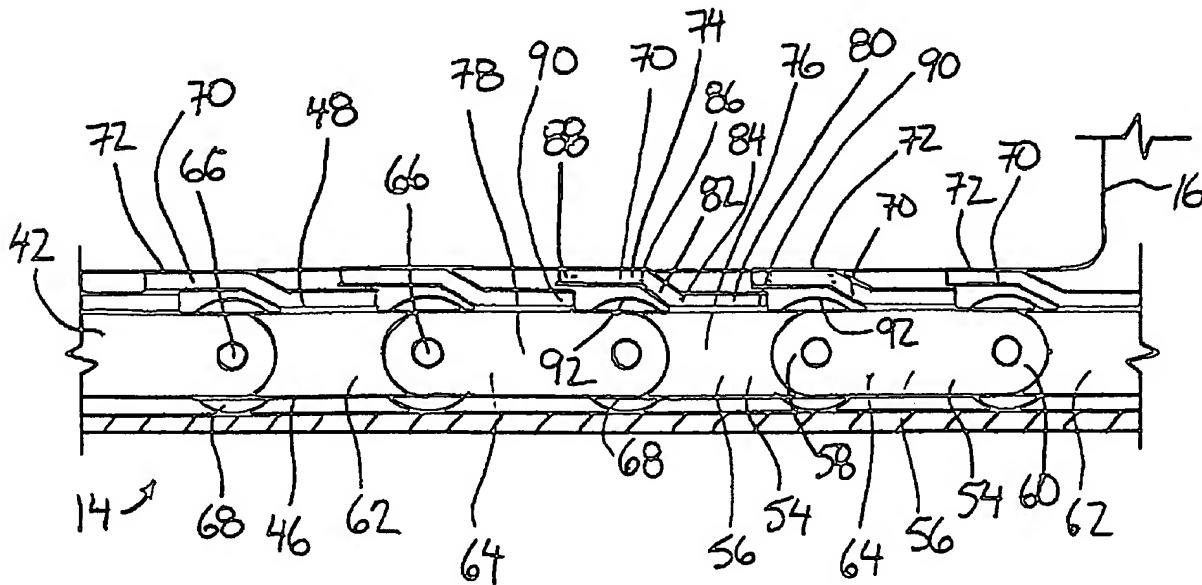
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(54) Title: ROLLER CHAIN CONVEYOR



(57) Abrégé/Abstract:

The present invention provides a roller chain conveyor for use in bale movers and the like. The roller chain conveyor includes a pair of parallel and spaced apart, elongate roller chains which are arranged to support a bale thereon. The roller chain includes a plurality of links having side plates which are coupled together using pivot pins as in a conventional chain. A plurality of rollers having a diameter which is greater than a depth of the side plates of the links are rotatably mounted on the pivot pins respectively. Guards plates are mounted spaced above each roller for supporting a load on a top side of the roller chain while permitting the rollers to rotate freely. The roller chains are thus supported for longitudinal rolling movement while supporting a load of bales thereon wherein the bales do not engage the rollers. Thus the bales are not damaged by the rollers and the rollers are not subjected to the significant frictional resistance forces normally imposed by the bales supported thereon.

ABSTRACT

The present invention provides a roller chain conveyor for use in bale movers and the like. The roller chain conveyor includes a pair of parallel and spaced apart, elongate roller chains which are arranged to support a bale thereon.

- 5 The roller chain includes a plurality of links having side plates which are coupled together using pivot pins as in a conventional chain. A plurality of rollers having a diameter which is greater than a depth of the side plates of the links are rotatably mounted on the pivot pins respectively. Guards plates are mounted spaced above each roller for supporting a load on a top side of the roller chain while permitting the
- 10 rollers to rotate freely. The roller chains are thus supported for longitudinal rolling movement while supporting a load of bales thereon wherein the bales do not engage the rollers. Thus the bales are not damaged by the rollers and the rollers are not subjected to the significant frictional resistance forces normally imposed by the bales supported thereon.

CLAIMS:

1. In an elongate roller chain for use on a roller chain conveyor for handling objects supported thereon, the roller chain conveyor having a frame and a track mounted on the frame to extend in a longitudinal direction from a front end to a 5 rear end of the frame, the roller chain having:

an inner side for being supported on the track of the conveyor for movement in the longitudinal direction and an outer side for supporting the objects thereon; and

a plurality of links, each link comprising:

10 two laterally spaced apart and parallel side plates extending in the longitudinal direction between respective ends of the link;

a laterally oriented pivot pin coupled between said side plates at each end of the link and pivotally coupling said side plates to the side plates at the end of an adjacent link having a similar configuration; and

15 a roller rotatably mounted on each pivot pin about a respective laterally extending axis and being oriented for rotation in the longitudinal direction along the track;

wherein the improvement comprises a plurality of guards respectively supported on the links on the outer side of the roller chain, each guard having an 20 outer face for supporting the object thereon which spans across one of the rollers of the respective link upon which the guard is supported from a mounting end of the guard supported on the side plates of the respective link between respective ends of the link to a free end of the guard supported over the mounting end of an adjacent guard having a similar configuration.

25 2. The roller chain according to Claim 1 wherein a diameter of the rollers is greater than a maximum depth between respective inner and outer edges

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of the side plates and wher in the free end of each guard is spaced from the outer side of the roller chain away from the respective roller over which the guard spans.

3. The roller chain according to Claim 1 wherein each guard comprises a rigid plate spanning from the mounting end to the free end thereof
5 between the side plates of the respective link mounting the guard thereon.

4. The roller chain according to Claim 1 wherein the free end of each guard is movable relative to the mounting end of said adjacent guard having a similar configuration over which the free end of the guard is supported.

5. The roller chain according to Claim 1 wherein each guard
10 includes a base member mounted between the side plates of the respective link supporting the guard thereon and wherein the guard comprises a flange coupled to the base member and extending in the longitudinal direction across the respective roller over which the guard spans.

6. The roller chain according to Claim 1 wherein each guard is
15 supported at the mounting end of the guard on the respective link between the rollers at each end of the link.

7. The roller chain according to Claim 1 wherein the outer face of each guard is spaced outwardly from the roller over which the guard spans for supporting a load on the outer face of the guard for permitting the roller to rotate
20 freely as the roller chain is moved in the longitudinal direction along the track.

8. The roller chain according to Claim 1 wherein the free end of each guard is supported directly on the mounting end of said adjacent guard having a similar configuration when the respective link supporting the guard thereon is oriented parallel to the adjacent links having a similar configuration.

25 9. The roller chain according to Claim 1 wherein each guard comprises a rigid member having:

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a base plate mounted between the side plates of the respective link supporting the guard thereon;

a mounting flange extending from a forward end of the base plate outwardly from the outer side of the roller chain; and

5 a guard plate mounted at a rearward end on the mounting flange to extend forwardly to a forward end which is supported on the rearward end of the base plate of said adjacent guard having a similar configuration.

10. A bale mover for handling bales supported thereon, the bale mover comprising:

10 an elongate frame for supporting the bales thereon;
a track mounted on the frame to extend in a longitudinal direction from a front end of the frame to a rear end of the frame; and

a chain conveyor having at least one roller chain supported on the track, said at least one roller chain having:

15 an inner side for being supported on the track of the conveyor for movement in the longitudinal direction and an outer side for supporting the bales thereon;

20 a plurality of links, each link comprising:
two laterally spaced apart and parallel side plates extending in the longitudinal direction between respective ends of the link;

a laterally oriented pivot pin coupled between said side plates at each end of the link and pivotally coupling said side plates to the side plates at the end of an adjacent link having a similar configuration;

25 a roller rotatably mounted on each pivot pin about a respective laterally extending axis and being oriented for rotation in the longitudinal direction along the track;

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and a plurality of guards respectively supported on the links on the outer side of the roller chain, each guard having an outer face for supporting the bales thereon which spans across one of the rollers of the respective link upon which the guard is supported from a mounting end of the guard supported on the 5 side plates of the respective link between respective ends of the link to a free end of the guard supported over the mounting end of an adjacent guard having a similar configuration.

11. The bale mover according to Claim 10 wherein a diameter of the rollers is greater than a maximum depth between respective inner and outer edges 10 of the side plates and wherein the free end of each guard is spaced from the outer side of said at least one roller chain away from the respective roller over which the guard spans.

12. The bale mover according to Claim 10 wherein each guard comprises a rigid plate spanning from the mounting end to the free end thereof 15 between the side plates of the respective link mounting the guard thereon.

13. The bale mover according to Claim 10 wherein the free end of each guard is movable relative to the mounting end of said adjacent guard having a similar configuration over which the free end of the guard is supported.

14. The bale mover according to Claim 10 wherein each guard 20 includes a base member mounted between the side plates of the respective link supporting the guard thereon and wherein the guard comprises a flange coupled to the base member and extending in the longitudinal direction across the respective roller over which the guard spans.

15. The bale mover according to Claim 10 wherein each guard is 25 supported at the mounting end of the guard on the respective link between the rollers at each end of the link.

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16. The bale mover according to Claim 10 wherein the outer face of each guard is spaced outwardly from the roller over which the guard spans for supporting a load on the outer face of the guard for permitting the roller to rotate freely as the roller chain is moved in the longitudinal direction along the track.

5 17. The bale mover according to Claim 10 wherein the free end of each guard is supported directly on the mounting end of said adjacent guard having a similar configuration when the respective link supporting the guard thereon is oriented parallel to the adjacent links having a similar configuration.

18. The bale mover according to Claim 10 wherein each guard
10 comprises a rigid member having:

a base plate mounted between the side plates of the respective link supporting the guard thereon;

a mounting flange extending from a forward end of the base plate outwardly from the outer side of the roller chain; and

15 a guard plate mounted at a rearward end on the mounting flange to extend forwardly to a forward end which is supported on the rearward end of the base plate of said adjacent guard having a similar configuration.

ROLLER CHAIN CONVEYOR

FIELD OF THE INVENTION

This invention relates to a conveyor and more particularly to a roller chain conveyor.

5 BACKGROUND

When handling large objects including large round bales, it is known to support the objects on a roller chain conveyor. For bale handling, conveyors of this type may be incorporated into a bale transporter including a frame supported on the ground for rolling movement and having a hitch at a forward end for coupling to a towing vehicle. A pair of longitudinal rails extend from the forward end to a rearward end of the frame. An endless roller chain is mounted on each rail such that an upper run of the chain is arranged for rolling movement along the corresponding rail. The pair of roller chains are thus arranged to displace a bale supported thereon longitudinally along the rails between the forward and rearward ends of the frame.

When supporting a bale on the pair of roller chains, the weight of the bale causes a bottom face of the bale to frictionally engage the rollers of chain, thus providing a significant resistance to the rotation of the rollers as the chains travel along the rails. The chains are thus limited in the number of bales that can be supported as overcoming this resistance to the rolling movement requires a significant amount of power. The resistance forces are even greater in damp weather or wet conditions which is often when many farmers desire to move the hay bales to shelter. The engagement of the rollers with the bale also causes wear and damage to the surface of the bale and the bale twine. This can lead to the bales coming apart, making it even more difficult to move the bales.

Furthermore, when towing the conveyor with a tractor is can be arranged to drive the roller chain from the hydraulic power take off of the tractor.

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When unloading a minimal number of bales, it is desirable to synchronise the forward movement of the tractor with the unloading speed of the roller chains which push the bales off the rearward end of the conveyor. However, the limited power of common tractor power take off systems generally is not sufficient to unload a significant number of bales at the same rate as the tractor's forward movement even if the tractor power train is engaged in its lowest gear. This requires a significant amount of clutching on the part of the tractor operator in order to synchronise the tractor speed with the unloading speed which is an annoyance to the operator and causes unnecessary wear on the tractor.

10 The present invention proposes a novel chain construction that ameliorates this problem in bale handling and other applications.

SUMMARY

According to one aspect of the present invention there is provided an elongate roller chain for use on a roller chain conveyor for handling objects supported thereon, the roller chain conveyor having a frame and a track mounted on the frame to extend in a longitudinal direction from a front end to a rear end of the frame; the roller chain having:

an inner side for being supported on the track of the conveyor for movement in the longitudinal direction and an outer side for supporting the objects thereon; and

a plurality of links, each link comprising:

two laterally spaced apart and parallel side plates extending in the longitudinal direction between respective ends of the link;

a laterally oriented pivot pin coupled between said side plates at each end of the link and pivotally coupling said side plates to the side plates at the end of an adjacent link having a similar configuration; and

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a roller rotatably mounted on each pivot pin about a respective laterally extending axis and being oriented for rotation in the longitudinal direction along the track;

wherein the improvement comprises a plurality of guards respectively 5 supported on the links on the outer side of the roller chain, each guard having an outer face for supporting the object thereon which spans across one of the rollers of the respective link upon which the guard is supported from a mounting end of the guard supported on the side plates of the respective link between respective ends of the link to a free end of the guard supported over the mounting end of an adjacent 10 guard having a similar configuration.

In normal use, the chains are oriented with the guards on a top side of the chain above the rollers while the rollers engage a track on bottom side of chain for rolling movement thereon. The use of guards which are mounted above each roller allow a load to be supported thereon above the roller such that rolling 15 movement of the rollers is not resisted by friction of the load which would otherwise engage a top side of the rollers. When used in a roller chain conveyor of a bale mover, the reduction of friction forces allows significantly more bales to be conveyed between respective ends of the bale mover with minimal power requirements as opposed to a roller chain which does not make use of guards mounted thereon. 20 Furthermore, the reduction in friction allows increased rates of unloading of the bale movers as compared to the use of a similar roller chain which does not use any guards mounted thereon. The guards also significantly reduce damage to the bales and subsequent damage to the twine supporting the bales which also makes the bales easier to move as they are not as likely to come apart.

25 When a diameter of the rollers is greater than a maximum depth between respective inner and outer edges of the side plates, the free end of each

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guard is preferably spaced from the outer side of the roller chain away from the respective roller over which the guard spans.

Each guard may comprise a rigid plate spanning from the mounting end to the free end thereof between the side plates of the respective link mounting 5 the guard thereon. Alternatively, various shapes and sizes of members may be used as a guard in place of a rigid plate.

The free end of each guard is preferably movable relative to the mounting end of said adjacent guard having a similar configuration over which the free end of the guard is supported.

10 Each guard may include a base member mounted between the side plates of the respective link supporting the guard thereon and a flange coupled to the base member and extending in the longitudinal direction across the respective roller over which the guard spans.

Each guard is preferably supported at the mounting end of the guard 15 on the respective link between the rollers at each end of the link.

The outer face of each guard may be spaced outwardly from the roller over which the guard spans for supporting a load on the outer face of the guard for permitting the roller to rotate freely as the roller chain is moved in the longitudinal direction along the track.

20 The free end of each guard is preferably supported directly on the mounting end of said adjacent guard having a similar configuration when the respective link supporting the guard thereon is oriented parallel to the adjacent links having a similar configuration.

Each guard may comprise a rigid member having:
25 a base plate mounted between the side plates of the respective link supporting the guard thereon;

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a mounting flange extending from a forward end of the base plate outwardly from the outer side of the roller chain; and

a guard plate mounted at a rearward end on the mounting flange to extend forwardly to a forward end which is supported on the rearward end of the
5 base plate of said adjacent guard having a similar configuration.

According to a second aspect of the present invention there is provided a bale mover for handling bales supported thereon, the bale mover comprising:

an elongate frame for supporting the bales thereon;

10 a track mounted on the frame to extend in a longitudinal direction from a front end of the frame to a rear end of the frame; and

a chain conveyor having at least one roller chain supported on the track, said at least one roller chain having:

an inner side for being supported on the track of the conveyor for movement in the longitudinal direction and an outer side for supporting the bales
15 thereon;

a plurality of links, each link comprising:

two laterally spaced apart and parallel side plates extending in the longitudinal direction between respective ends of the link;

20 a laterally oriented pivot pin coupled between said side plates at each end of the link and pivotally coupling said side plates to the side plates at the end of an adjacent link having a similar configuration;

a roller rotatably mounted on each pivot pin about a respective laterally extending axis and being oriented for rotation in the longitudinal direction along the track;

25 and a plurality of guards respectively supported on the links on the outer side of the roller chain, each guard having an outer face for supporting the

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bales thereon which spans across one of the rollers of the respective link upon which the guard is supported from a mounting end of the guard supported on the side plates of the respective link between respective ends of the link to a free end of the guard supported over the mounting end of an adjacent guard having a similar
5 configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings, which illustrate an exemplary embodiment of the present invention:

Figure 1 is a side elevational view of a roller chain conveyor according
10 to the present invention.

Figure 2 is a rear end view of the roller chain conveyor along the line 2-2 of Figure 1.

Figure 3 is an enlarged top view of the roller chain used on the conveyor of Figure 1.

15 Figure 4 is a side elevational view of the roller chain of Figure 3.

Figure 5 is a bottom plan view of the roller chain of Figure 3.

DETAILED DESCRIPTION

Referring to the accompanying drawings, there is illustrated a roller chain conveyor generally indicated by reference numeral 10. A pair of the
20 conveyors 10 are shown mounted on a bale mover 12 including a plurality of roller chains 14 which are arranged to support large round bales 16 thereon.

The bale mover 12 includes an elongate frame 18 which is supported on wheels 20 for rolling movement along the ground in a forward direction. A hitch 22 is mounted at a front end 24 of the frame 18 for attachment to a towing vehicle for
25 towing the frame in the forward direction. The conveyors 10 are mounted on the frame to extend longitudinally from the front end to a rear end 26 of the frame. A set

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of longitudinal support members 28 are mounted to extend along each side 30 of the frame as well as centrally along the frame.

In use, the bale mover is arranged to be towed in the forward direction by the towing vehicle while the conveyors are arranged to convey bales supported 5 thereon from the front end to the rear end of the frame. As shown in Figure 1, the frame can be tilted upwards by a hydraulic support 32 for dumping bales off the rear end 26 of the frame and depositing the bales adjacent the ground as the bale mover is moved forwardly.

Each conveyor 10 comprises a pair of longitudinally extending rails 34 10 each of which are arranged to support a roller chain 14 thereon. A U-shaped channel 36 is mounted on a top side of each rail to extend longitudinally therewith. Each channel includes a bottom 38 and a pair of sides 40 extending upwardly from the bottom. The channels 36 receive the respective roller chains 14 therein for longitudinal movement of the chains relative to the respective channels.

15 Each roller chain 14 comprises an endless elongate chain having an upper run which is supported in the corresponding channel 36 and a lower run extending along a bottom side of the frame between the front and rear ends of the frame. An inner side 46 of each upper run is thus arranged to ride along the bottom 38 of the respective channel while an outer side 48 of the upper run is arranged to 20 support the bales thereon.

The upper and lower runs meet at the respective front and rear ends of the frame such that each chain forms a continuous and endless loop. Each chain meshes with a respective sprocket 50 at the forward and rearward end for supporting the chain thereon and driving its rotation. The sprockets 50 at the front 25 end 24 of the frame are connected by a drive shaft 52 which is driven by a hydraulic motor. The hydraulic motor is arranged to be coupled to a power take-off system of

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a towing vehicle such as a tractor.

Each chain comprises a plurality of links generally indicated by reference numeral 54. Each link comprises a pair of upright side plates 56 which are spaced apart and parallel to each other. The side plates 56 extend longitudinally

5 with the chain between a front end 58 and a rear end 60 of the link. The links are coupled in a conventional manner wherein the side plates alternate between a pair of inner link plates 62 and a pair of outer link plates 64 of an adjacent link. In this arrangement respective ends of the links are overlapping such that they may be pivotally coupled together by respective pivot pins 66 located at the pivotal coupling

10 between each pair of adjacent links.

Each pivot pin 66 includes a pair of retainers at respective ends thereof for securing the pin in place. A roller 68 is mounted for rotation about each pivot pin 66 such that the roller is oriented to rotate in a longitudinal direction along the respective rail about a respective laterally extending axis. A diameter of each roller

15 is greater than a maximum depth between respective top and bottom edges of the side plates such that the chains 14 are arranged for rolling movement within the respective channels 36.

A guard 70 is associated with each roller 68 adjacent the outer side of the chain for supporting a load thereon while the rollers are permitted to rotate freely.

20 Each guard 70 comprises a flat rigid plate which is mounted upwardly and above the corresponding roller associated therewith. The guard 70 spans over the roller between the respective side plates of a link 54 mounting the guard thereon. Each guard 70 includes an upper engaging face 72 arranged to support the load of the bales thereon.

25 Each guard is mounted a rear end 74 of the guard on a corresponding first link 76 coupled to the corresponding roller associated therewith to extend

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rearward therefrom. The guard extends longitudinally forward over the roller and a second link 78 coupled to the corresponding roller associated therewith to extend forward therefrom. The guard is not directly mounted on the second link 78 such that the second link is free to pivot relative to the first link while also supporting the
5 guard thereon when the links are oriented to extend parallel to each other.

A base plate 80 is provided for mounting each guard 70 on the corresponding first link 76. The base plate 80 spans between the respective side plates 56 of the corresponding link mounting the plate thereon at a location spaced between the respective ends of the link. A mounting flange 82 extends upwardly
10 and forwardly at an incline from a front end 84 of each base plate 80.

Each guard 70 extends longitudinally in a forward direction from a front end 86 of the corresponding mounting flange 82 to a free end 88 of the guard. The free end 88 of the guard is thus arranged to be supported on a rear end 90 of an adjacent base plate mounting an adjacent guard thereon. The mounting flange 82
15 ensures that the guard is spaced above a periphery 92 of the corresponding roller when the links are oriented to extend parallel to each other while the guard remains supported at both a forward and rearward end thereof.

In use, the upper engaging faces 72 of the respective guards define a supporting surface for supporting the bales thereon as shown in Figure 2. In this
20 arrangement, the bales are restricted from engaging the rollers 68 as shown in Figure 4. The frictional forces which act to resist rotation of the rollers 68 is thus significantly reduced such that on a bale mover of the type shown in Figures 1 and 2, a third row of bales may be supported atop respective first and second rows supported directly on the conveyors 10. The limited hydraulic powered take-off
25 systems of conventional tractors are easily able to convey the three rows of bales shown in Figure 2 even in damp or wet conditions. The reduction of friction forces

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acting against rolling movement of the respective roller chains also permits the bales to be unloaded at an increased rate. In general, when unloading bales using the roller chain of the present invention a farmer is able to unload the bales off the rear end of the bale mover at a rate which is equal or greater to the speed of the tractor

5 in its lowest gear such that the farmer does not require continuous clutching of the tractor to slow the tractor.

In alternate embodiments of the present invention, the guards may be mounted in various arrangements. In one embodiment, every second link of the roller chain may mount a pair of guards wherein each guard extends over a roller at

10 a respective end of the link. Furthermore, the guards may comprise any type of rigid supporting member other than the flat plate shown in the drawings. In another embodiment the guard may comprise one or more extensions mounted on the respective side plates of each link wherein each extension is a raised protrusion which extends upwardly beyond a height of the respective rollers at each end of the

15 link. In either case the guard includes an engaging face which is spaced upwardly from the roller for supporting a load thereon such that the load is spaced upwardly from the roller and the roller is free to pivot without engaging the load supported thereon.

While one embodiment of the present invention has been described in

20 the foregoing, it is to be understood that other embodiments are possible within the scope of the invention. The invention is to be considered limited solely by the scope of the appended claims.

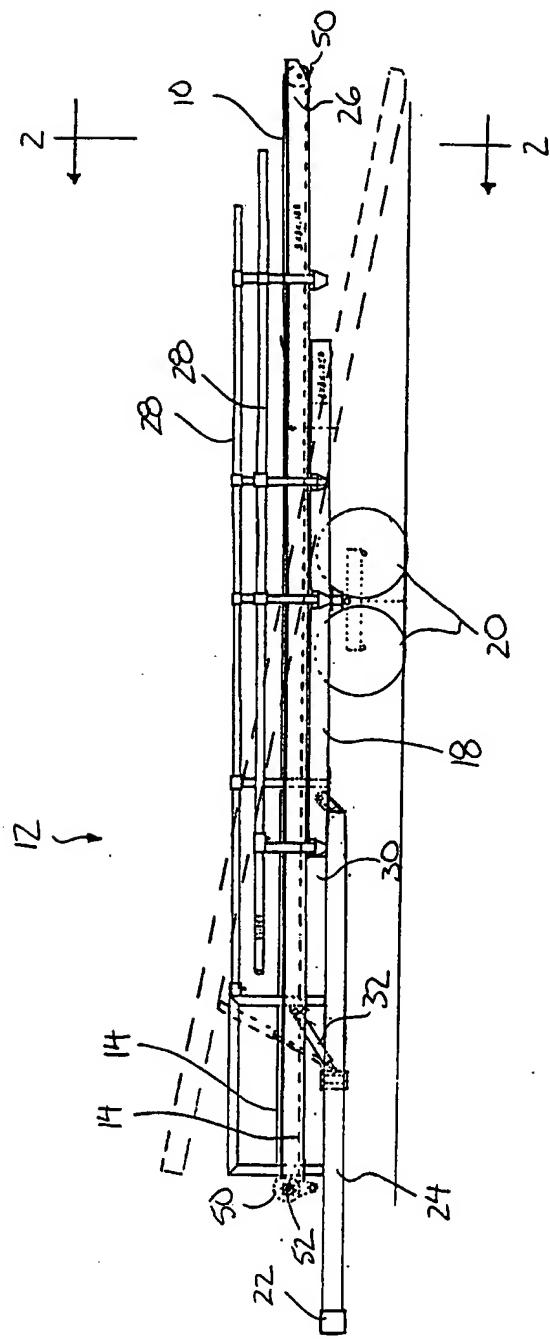


FIG. 1

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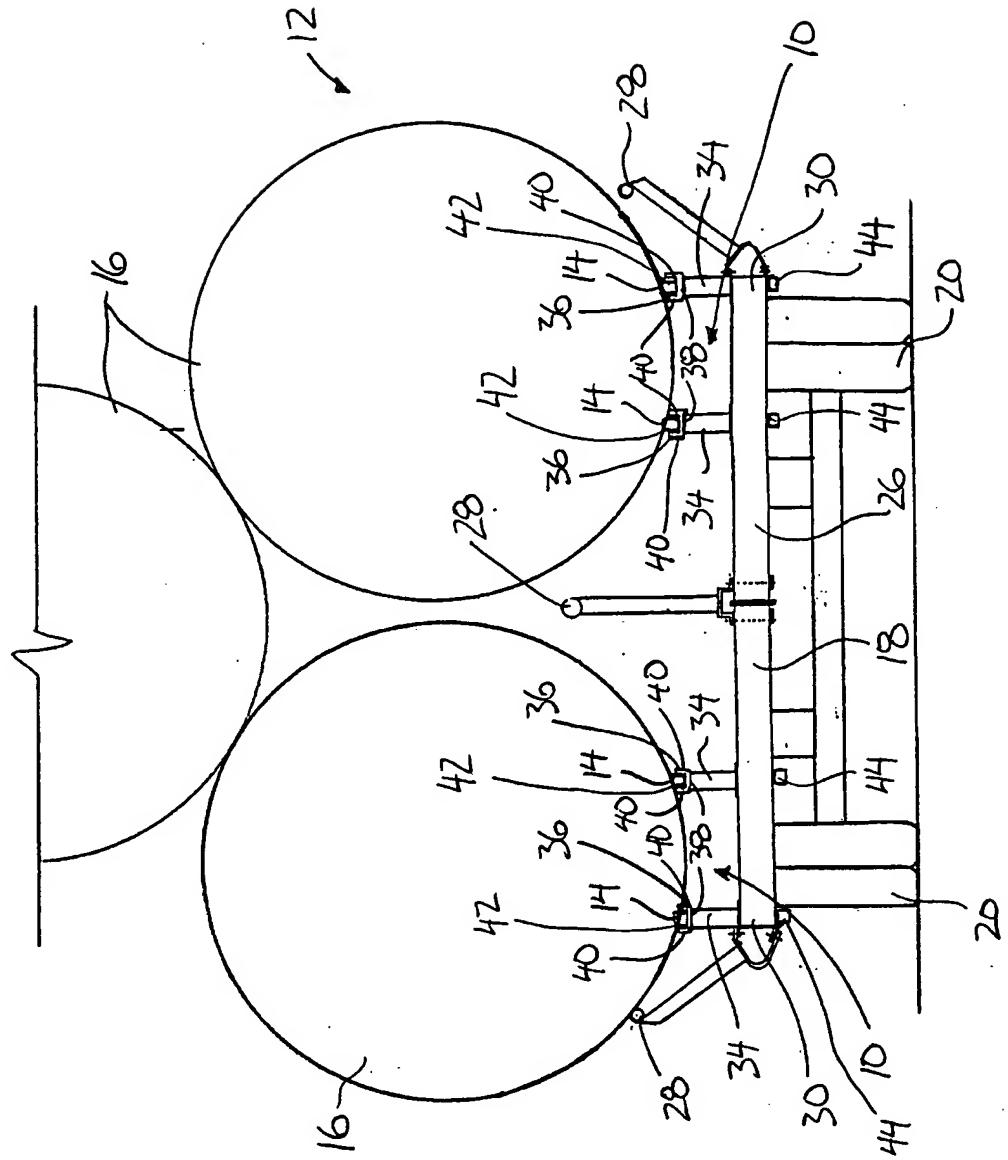
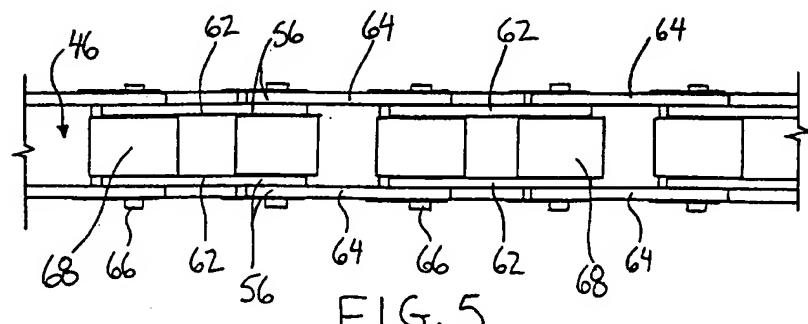
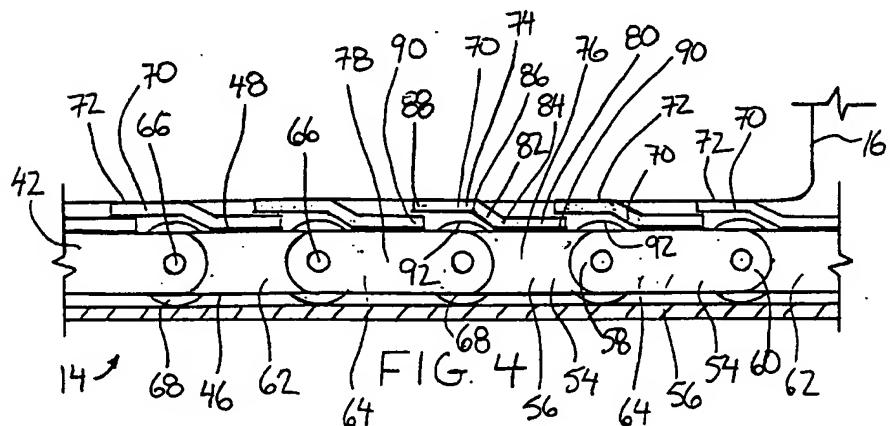
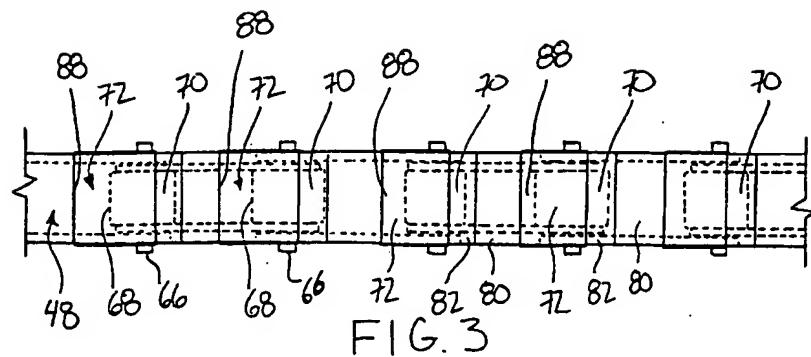


FIG. 2

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